



Materials System Specification

04-SAMSS-035

11 September 2013

General Requirements for Valves

Document Responsibility: Valves Standards Committee

Saudi Aramco DeskTop Standards

Table of Contents

1	Scope.....	2
2	Conflicts and Deviations.....	2
3	References.....	2
4	Definitions.....	5
5	General.....	5
6	Design and Dimensions.....	8
7	Materials.....	11
8	Operators.....	12
9	Quality Requirements.....	13
10	Painting and Coating.....	13
11	Marking.....	13
12	Preparation for Shipment.....	13
	Sketch A - Drain, Vent and Sealant Piping for Buried Valves (Typical Arrangement).....	16
	Sketch B - Valve End Protection Requirements (NPS 3 and above).....	17
	Appendix 1 - Business Models.....	18

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Revised paragraphs are indicated in the right margin

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Page 1 of 18

1 Scope

- 1.1 This Specification defines the general requirements for valves normally classified under Saudi Aramco Materials System (SAMS) Class 04.
- 1.2 Specifically excluded from the scope are requirements for: Class 04 [API SPEC 6A](#) 10,000 psi valves and chokes covered by 04-SAMSS-049; control, safety-relief, relief, surge-relief, solenoid, pilot and other type valves classified under SAMS Class 34; and wellhead valves classified under SAMS Class 45.

2 Conflicts and Deviations

- 2.1 Any conflicts between this specification and other applicable Saudi Aramco Materials System Specifications (SAMSS), Engineering Standards (SAES), Standard Drawings (SASD), or industry standards, codes, and forms shall be resolved in writing by the Company or Buyer representative through the Valves Standards Committee Chairman (VSCC), Consulting Services Department of Saudi Aramco, Dhahran.
- 2.2 Direct all requests to deviate from this specification in writing to the Company or Buyer representative, who shall follow internal company procedure [SAEP-302](#) and forward such requests to the VSCC, Consulting Services Department of Saudi Aramco, Dhahran.

3 References

Material or equipment supplied to this specification shall comply with the latest edition of the references listed below, unless otherwise noted.

3.1 Saudi Aramco References

Saudi Aramco Engineering Procedure

[SAEP-302](#)

Instructions for Obtaining a Waiver of a Mandatory Saudi Aramco Engineering Requirement

Saudi Aramco Engineering Standards

[SAES-H-001](#)

Coating Selection and Application Requirements for Industrial Plants and Equipment

[SAES-H-002](#)

Internal and External Coatings for Steel Pipelines and Piping

[SAES-H-004](#) *Protective Coating Selection and Application Requirements for Offshore Structures and Facilities*

[SAES-H-101V](#) *Approved Saudi Aramco Data Sheets - Paints and Coatings*

Saudi Aramco Materials System Specifications

[04-SAMSS-048](#) *Valve Inspection and Testing Requirements*

[34-SAMSS-716](#) *Pneumatic Actuators On-Off Service*

[34-SAMSS-717](#) *Hydraulic Valve Actuators*

[34-SAMSS-718](#) *Electric Motor-Operated Valve Actuators*

Saudi Aramco Inspection and Testing Requirements

Form [175-043000](#) *Valve Materials Certification Requirements*

Form [175-043600](#) *VALVES: Metallic; Includes Gate, Globe, Angle, Check, Needle, Ball, Plug, Piston, Butterfly, and Choke*

Form [175-043601](#) *Low Severity, Valves*

Saudi Aramco Forms and Data Sheets

[SA-6233-1](#) *Valve Data Sheet*

3.2 Industry Codes and Standards

American Petroleum Institute

[API SPEC 6A](#) *Specification for Wellhead and Christmas Tree Equipment*

[API SPEC 6D](#) *Specification for Pipeline Valves (Gate, Plug, Ball, and Check Valves)*

[API SPEC 6FA](#) *Specification for Fire Test for Valves*

[API RP 591](#) *Process Valve Qualification Procedure*

[API STD 602](#) *Steel Gate, Globe and Check Valves for Sizes DN 100 and Smaller for the Petroleum and Natural Gas Industries*

[API STD 607](#) *Testing of Valves - Fire Type-testing Requirements*

[API STD 622](#) *Type Testing of Process Valve Packing for Fugitive Emissions*

American Society of Mechanical Engineers

<u>ASME B1.20.1</u>	<i>Pipe Threads, General Purpose (Inch)</i>
<u>ASME B16.1</u>	<i>Cast Iron Pipe Flanges and Flanged Fittings</i>
<u>ASME B16.5</u>	<i>Pipe Flanges and Flanged Fittings</i>
<u>ASME B16.10</u>	<i>Face-to-Face and End-to-End Dimensions of Valves</i>
<u>ASME B16.11</u>	<i>Forged Fittings, Socket-Welding and Threaded</i>
<u>ASME B16.20</u>	<i>Metallic Gasket for Pipe Flanges</i>
<u>ASME B16.25</u>	<i>Buttwelding Ends</i>
<u>ASME B16.42</u>	<i>Ductile Iron Pipe Flanges and Flanged Fittings, Class 150, 300</i>
<u>ASME B16.47</u>	<i>Large Diameter Steel Flanges NPS 26 through NPS 60</i>
<u>ASME B46.1</u>	<i>Surface Texture</i>
<u>ASME SEC IX</u>	<i>Boiler & Pressure Vessel Code, Welding and Brazing Qualification</i>

American Society for Testing and Materials

<u>ASTM A193</u>	<i>Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service</i>
<u>ASTM A703</u>	<i>Steel Castings, General Requirements, for Pressure Containing Parts</i>
<u>ASTM B733</u>	<i>Standard Specification for Autocatalytic Nickel- Phosphorus Coatings on Metals</i>

American Water Works Association

<u>AWWA C550</u>	<i>Protective Interior Coatings for Valves and Hydrants</i>
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Manufacturers Standardization Society

<u>MSS SP-25</u>	<i>Marking System for Valves, Flanges, Fittings and Unions</i>
<u>MSS SP-45</u>	<i>Bypass and Drain Connection Standard</i>

National Association of Corrosion Engineers

<u>NACE MR0175/ISO 15156</u>	<i>Petroleum and Natural Gas Industries – Materials for Use in H₂S Containing Environments in Oil and Gas Production</i>
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International Organization for Standardization

<u>ISO 9000</u>	<i>Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation and Servicing</i>
<u>ISO 9001</u>	<i>Quality Management Systems - Requirements</i>
<u>ISO 10497</u>	<i>Testing of Valves - Fire Type-Testing Requirements</i>

British Standards Institution

<u>BS EN ISO 5210</u>	<i>Industrial Valves - Multi-Turn Valve Actuator Attachments</i>
<u>BS EN ISO 5211</u>	<i>Industrial Valves - Part-Turn Actuator Attachments</i>

4 Definitions

Buyer's Representative: The person acting on behalf of the Buyer, who may be from the Engineering, Inspection, Purchasing, Standardization or User Organization.

Valves Standards Committee Chairman (VSCC): The Saudi Aramco assigned Engineering Specialist from Consulting Services Department, Dhahran, who originates and is responsible for all Class 04 valve technical specifications and standards or his delegated representative.

5 General

5.1 Qualification Procedure for Vendors Manufacturing Facilities and their Products

5.1.1 As a minimum, all vendors shall meet the requirements listed in [Appendix 1](#), and shall be required to undergo a plant survey and an engineering evaluation of their products with respect to their capability of meeting Saudi Aramco specifications and applicable industry standards. Other manufacturing Business Models not covered by [Appendix 1](#) shall be subject to the review and approval of the VSCC. Additional requirements such as the following (but not limited to) may be imposed subject to the review of the VSCC:

- a) API RP 591,
- b) Industry standard monogram or other certification,
- c) Satisfactory destructive examination of sample valves, and
- d) ASTM A703 with Supplementary Requirements S2, S14, S22, and S26,

may also be imposed subject to the review of the VSCC. No Purchase Orders shall be placed on any Vendor unless the Vendor has undergone and passed this technical evaluation.

- 5.1.2 Proposed new valves shall have been in service with a satisfactory performance history at three locations with three different major oil and gas companies such as Exxon-Mobile, Chevron, Shell, BP, ConocoPhillips, Texaco in Europe and North America for at least five years each. Other history periods shall be subject to the review and approval of the VSCC. The vendor shall provide an experience list including valves size, rating, service and the names of specific persons to contact with their e-mail addresses and telephone and facsimile numbers.
- 5.1.3 When requested, manufacturers shall submit their list of sub-suppliers who provide castings and forgings for pressure retaining components (bodies, bonnets, etc.) to the VSCC for review and approval. The manufacturer shall not add any other casting sub-supplier to this list without the approval of the VSCC. The approved list shall be attached to all biddings.

As a minimum, the casting and forging sub-suppliers shall submit the following certificates and documentation for VSCC evaluation:

- ISO 9001 certificates or equivalent
- Pressure Equipment Directive (PED) Certificate or equivalent
- Years of experience of casting/forging different sizes and ratings
- Customer reference list.
- Other certifications, testing or documents may be requested depending on supplier history and experience.

5.2 Vendor's Drawing Approval

- 5.2.1 Before start of manufacture, the Vendor shall supply detailed drawings of the proposed valves for approval. (If requested as stated in para. 5.2.3 below). The drawings shall depict the following (as applicable):
- a) Stem sealing arrangement and seat ring assembly details.
 - b) All pressure retaining welds and hard facing or corrosion resistant overlays together with the applicable WPS and PQR.
 - c) A list of all the applicable industry and Saudi Aramco specifications.
 - d) A bill of materials indicating the specific ASTM or equivalent material specification for each part.

- e) Gear operator and calculated human operator force to comply with 8.2 of this specification.
- f) Internal coating specifications.
- g) Vendor shall also supply any other information required to show that the valves comply fully with the purchase order.

5.2.2 Vendor shall be fully responsible for the valve drawing and its compliance with all applicable standards. Any drawing approval, acceptance or stamping will do not relief the Vendor of full responsibility for product standards compliance, quality, reliability and integrity.

5.2.3 When requested by Saudi Aramco Engineering, Material supply, PMT or End User, the Vendor shall supply detailed drawings of the proposed valves for approval before start of manufacture. The Vendor shall obtain formal drawing approval through the Buyer as follows:

- a) If the purchase is made through the Saudi Aramco SAP Materials Group (SMG), approval authority is the Saudi Aramco Material Standardization / Projects & Strategic Purchasing Department.
- b) If the purchase is made through the Saudi Aramco Direct Charge system, the approval authority is the organization originating the requisition.
- c) If the purchase is made through a Contractor to Saudi Aramco, refer to the contract for the appropriate approval authority.

5.2.4 The Vendor shall manufacture the proposed valves strictly in accordance with the submitted drawings which shall be retained in his files. If any subsequent change is proposed, the Vendor shall provide revised drawings for review and compliance as stated above.

5.2.5 It is the vendor's responsibility to insure that all sub-suppliers comply with the applicable industry and Saudi Aramco standards.

5.2.6 When requested by Saudi Aramco VSCC, vendor shall submit detailed machine drawings of valves parts including, bodies, bonnets, trim, etc.

5.3 Welding

Welding procedures and welder performance qualifications shall be in accordance with [ASME SEC IX](#).

5.4 Valve Data Sheet

Buyer's Representative shall fill out Form [SA-6233-1](#) for each non-SMG line item and attach it to the Purchase Requisition/Order.

6 Design and Dimensions

6.1 Flanged Ends

Flange dimensions for steel valves shall comply with the latest revisions of the following:

Up to 24 inch, ASME Classes:	ASME B16.5
26 inch and above, ASME Classes:	ASME B16.47 Series A
All Sizes, API 6A Classes:	API SPEC 6A

Commentary note for replacement of existing valves:

Buyer shall reference the applicable standard drawing for flange dimensions of existing valves other than those listed in above standards. Non-standard flanges such as NPS 30 and larger in Class 1500 and higher shall mate with the pipe flanges. Saudi Aramco's Engineer shall approve the design and dimensions prior to start of manufacture.

Ring grooves shall comply with [ASME B16.20](#).

Compact type flanges may be used only with prior approval of the VSCC.

The gasket contact surface of all steel raised face flanges shall have a smooth machine finish in the range 3.2 to 6.4 micrometers AARH (see [ASME B46.1](#)), and shall also be applicable to the faces of unlined wafer-type valves.

6.2 Weld Ends

- a) Butt welding ends for all valve sizes shall be prepared in accordance with [ASME B16.25](#) for use without a backing ring.
- b) Valves 2" and below with soft seals or seats shall have factory-installed extension nipples or extended bodies to prevent damage due to welding heat.

6.3 Drains, Vents and other Body Fittings (Steel Valves)

6.3.1 Drain size and location shall be in accordance with [MSS SP-45](#). For sizes above 24", drain size shall be 2" minimum or as specified by the P.O.

6.3.2 Socket weld connections shall comply with [ASME B16.11](#).

- 6.3.3 Threaded connections shall comply with [ASME B1.20.1](#), NPT.
 - 6.3.4 Small steel threaded and socketweld end valves that are accessories to the main valve shall have a minimum body rating equivalent to API STD 602, Class 800.
 - 6.3.5 All sealant injection fittings shall be one-piece giant buttonhead type with internal check valve mechanisms, and shall be equipped with safety vent caps. Minimum metallurgy shall be as follows: Body - 316 SS, spring - Inconel, ball - Monel.
 - 6.3.6 When a seat sealant injection fitting is required, a check valve shall be installed in the body wall under the sealant injection fitting.
 - 6.3.7 All valve threaded body connections including drain, vent and sealant injection piping shall be seal welded, except those that are frequently removed (such as vent and drain plugs) or those that contain moving parts (such as injection fittings, relief valves, etc.).
 - 6.3.8 All drain valves and associated piping components shall have corrosion resistance at least equal to the trim material of the main valve, and shall be AISI 316L SS as a minimum.
 - 6.3.9 Vent and relief valves, when provided, shall have corrosion resistance at least equal to the body material of the main valve, and shall be carbon steel with SS 316 trim as a minimum.
 - 6.3.10 All drain and vent valves shall have hard faced seat rings.
 - 6.3.11 Drain and vent valve piping shall be fixed in such a way to avoid damage due to vibration or external impact.
 - 6.4 Buried and Inaccessible Double-Block-and-Bleed Valves
 - 6.4.1 Buried and inaccessible double- block-and-bleed valves shall have the drain, vent and sealant injection connections (if applicable) extended above ground in accordance with [SKETCH A](#) and as per the following requirements:
 - a) All piping (schedule 80 minimum), valves and fittings shall have corrosion resistance at least equal to the main valve body material, and shall be SS 316L as a minimum. The entire piping system shall be coated with the same coating system as the main valve.
 - b) Compression fittings shall not be used.
 - c) Unions are permitted only in the extended lines of in-line
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repairable valves (top-entry ball valves and through conduit gate valves) at a suitable location to facilitate removal of the bonnet.

- d) The drain and vent connections shall be piped up to approximately 250 mm below the operating level and shall terminate in a horizontally-installed block valve fitted with an NPT-threaded steel plug.
- e) The sealant injection lines shall be piped up separately to approximately 250 mm below the operating level and terminate in a horizontally-installed one-piece sealant injection fitting giant button-head type with internal check valve mechanism. An additional check valve shall be provided at the location where the sealant injection line enters the valve body.
- f) All piping shall follow the valve contour as closely as possible and shall be rigidly connected to the valve and stem extension.
- g) All piping shall have an AISI Type 316 stainless steel nameplate attached to identify the service.

6.5 Cast iron valves shall be flanged per [ASME B16.1](#).

6.6 Ductile iron valves shall be flanged per [ASME B16.42](#). The face-to-face dimension shall be in accordance with [ASME B16.10](#).

6.7 Bolted Bonnet/Cover Valves

The length of thread engagement between each bolt (or stud) and the body shall be at least equal to the nominal diameter of the bolt. For “capscrew type” bolts used for body-to-bonnet flange connections, the bolts shall be flush with the bottom of the body flange.

6.8 Ball Valves

Stems shall be blowout-proof.

6.9 The plug surface of lubricated plug valves shall have an antifriction treatment.

6.10 When specified in the Purchase Requisition/Order, valves shall be qualified “fire-safe” in accordance with [API STD 607](#), [ISO 10497](#) or [API SPEC 6FA](#).

6.11 Pipeline Valves

[API SPEC 6D](#) valves (ball & gate) shall be designed to withstand a compressive axial thrust, exerted by the piping without permanent distortion of the body and without jamming the gate/ball between the seats. The Vendor shall have

conducted tests on representative samples to demonstrate satisfactory valve performance under pipeline compression and/or bending loads. Vendor shall submit his test procedure and test reports for review by the VSCC.

6.12 Valve to actuator mounting shall be in accordance with [BS EN ISO 5210](#) or [BS EN ISO 5211](#).

6.13 Valve packing design shall comply with the requirements of API STD 622.

7 Materials

7.1 Materials shall be suitable for continuous exposure at the service conditions and ratings specified. Any variation, including temperature limitations for soft-seal parts, must be brought to the attention of the VSCC during the Vendor's drawing approval stage per Section [5.2](#).

The Vendor shall ensure that all materials used for valve components in rubbing or sliding contact will not gall.

Materials for valves in wet sour service shall meet the requirements of [NACE MR0175/ISO 15156](#).

7.2 When butt welding end valves are made of carbon steel with a specified minimum yield strength of 289 MPa (42,000 psi) or higher, the maximum carbon content shall not exceed 0.23% as specified in [API SPEC 6D](#) Section 7. For fabricated valves, this limitation applies only to the ends.

7.3 Unless otherwise specified, hardfacing shall be Stellite No.6 or equal; Stellite No.21 or equal is acceptable when permitted by the applicable industry standard.

7.4 Low carbon grades of austenitic stainless steels are acceptable substitutes for the corresponding regular carbon grades, but not vice versa.

7.5 The corrosion resistance of body-bonnet bolting and metallic gasket materials shall be at least equal to that of the body. However, the bolting material is not required to be more corrosion resistant than austenitic stainless AISI Type 316 (per [ASTM A193](#)) unless specified in the Purchase Order.

7.6 Plating

7.6.1 Electroless nickel plating (ENP) on carbon and low alloy steel substrates shall be applied in accordance with the requirements of [ASTM B733](#), SC4, Type III, Class 3, (carbon steel or low alloy substrate)/NiP10 75. For testing and acceptance criteria, refer to [04-SAMSS-048](#).

7.6.2 Special considerations apply to plating on stainless steel substrates. The Vendor shall submit his proposal for approval to the VSCC, when specified in the Purchase Requisition/Order.

7.7 Spring material, if springs are required, shall be UNS R30003 (Elgiloy), UNS N06600 (Alloy 600) UNS N07750 (Alloy X-750), UNS R30035 (Alloy MP35N) or per [NACE MR0175/ISO 15156](#).

8 Operators

8.1 Gear boxes shall be dust and weather-proof and filled with a lubricant suitable for operation up to 80°C.

8.2 Gear operators for quarter turn valves shall be equipped with a self-locking system.

8.3 All valves operators/actuators mechanisms (including hand-wheel, lever, gear and power) shall be designed to stroke the specified valve from the fully open position to the fully closed position and vice versa, under the worst process operating conditions (breakaway, running, seating).

8.4 The maximum (human) operator force required to seat or unseat the valve at the maximum specified differential pressure shall not exceed 360N (80 pounds) at the rim of the hand-wheel.

8.5 Anti-torque devices such as shear pins or mechanical input stops are permitted. The Vendor shall provide detailed technical specifications of the proposed device, the allowable loads with and without the device, and the additional costs.

8.6 Actuators

All actuators shall be purchased from a source approved by Saudi Aramco. The Vendor shall guarantee the satisfactory performance of the complete unit under the service conditions specified. In addition, actuators shall be supplied in accordance with the following requirements:

- a) Electric motor operator shall comply with [34-SAMSS-718](#).
- b) Pneumatic actuator shall comply with [34-SAMSS-716](#).
- c) Hydraulic Valve Actuator shall comply with [34-SAMSS-717](#).

8.7 Mounting brackets for actuators shall be carbon steel or ductile iron.

9 Quality Requirements

9.1 Quality Program

The Vendor shall implement and maintain an acceptable Quality Program, equivalent to the [ISO 9000](#) Series. The Quality Program documents shall be made available to the Buyer's Representative for review and audit.

9.2 Testing and Inspection Requirements

Testing and inspection shall comply with [04-SAMSS-048](#), Valve Inspection and Testing Requirements. The items manufactured to this specification are subject to verification by the Buyer's Inspection Representative per Saudi Aramco Inspection Requirements Form [175-043000](#), [175-043600](#) and [175-043601](#) (or specially modified versions), as applicable, attached to the Purchase Order.

10 Painting and Coating

10.1 External and internal coatings shall be in accordance with [SAES-H-001](#), [SAES-H-002](#) and [SAES-H-004](#).

10.2 Only approved products shall be used as per [SAES-H-101V](#) and [SAES-H-002V](#).

Other new products shall be submitted for evaluation and approval by the Nonmetallics & Protective Coating Unit of Consulting Services Department accordingly.

11 Marking

11.1 The valves shall be marked in accordance with [MSS SP-25](#).

11.2 For valves NPS 2 and larger, identification plates shall be of an austenitic stainless steel.

12 Preparation for Shipment

12.1 All valves shall be completely drained of test fluid and thoroughly dried after hydrotesting. The machined surfaces shall be coated with a light film of high viscosity rust inhibiting oil which will not become fluid and run off at temperatures below 80°C.

12.2 Flanged valves NPS 6" and smaller in Class 150 and Class 300 shall be fitted with UV resistant plastic covers. For other sizes, valve end flanges shall be fitted with plywood covers. The cover diameter shall be the same as the outside

diameter of the flange and shall be at least 10 mm thick for valves up to NPS 24" and 12 mm thick for valves NPS 26" and larger. The cover shall be attached by machine bolts with a nut and washer fitted on the inside of the flange. There shall be minimum four (4) bolts on valves up to NPS 24" nominal size and eight (8) bolts on valves NPS 26 inch and larger. The bolts diameter shall not be less than ¼ the size of the flange bolt hole.

In addition to the above, all flange facings (ring joint, raised and flat) shall be covered with NBR (based) rubber Self-Adhesive protection (see fig below) that meets the following:

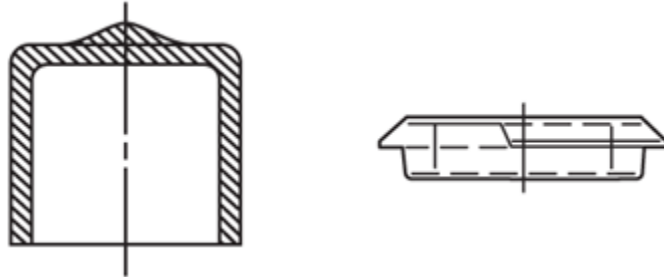
- Oil, ozone and weather resistant
- Minimum thickness of 1.5 mm
- Withstand temperatures up to 75°C
- Non deforming, loosening or detaching
- Proof against sand blasting
- No glue residue
- Chloride free



Valve weld ends shall likewise be fitted with plywood covers of matching outside diameter. The covers shall be securely attached to the valve by means of wire or steel banding. Protection caps (similar to sketch below) that meet the following:

- Oil, ozone and weather resistant
- Withstand temperatures up to 75°C
- Non deforming, loosening or detaching

shall be used between valve end connection and plywood.



Valves shipped in the open position shall have tie rods fitted through the valve bores.

A graphical representation of the valve end protection requirements covered in the above paragraphs is provided in the attached [SKETCH B](#) (See Figures 1 and 2).

- 12.3 The ends of threaded and socket weld end valves shall be protected with tight fitting plastic caps.

The Vendor may propose an alternative protection system for approval by the Valves Standards Committee Chairman.

Revision Summary

20 February 2012	Major revision.
29 July 2012	Editorial changes on pages 6 & 18.
11 September 2013	Minor revision to have a criteria based on which to accept and reject valve manufacturers and to set minimum test requirements for valve packing.

Sketch A – Drain, Vent and Sealant Piping for Buried Valves (Typical Arrangement)

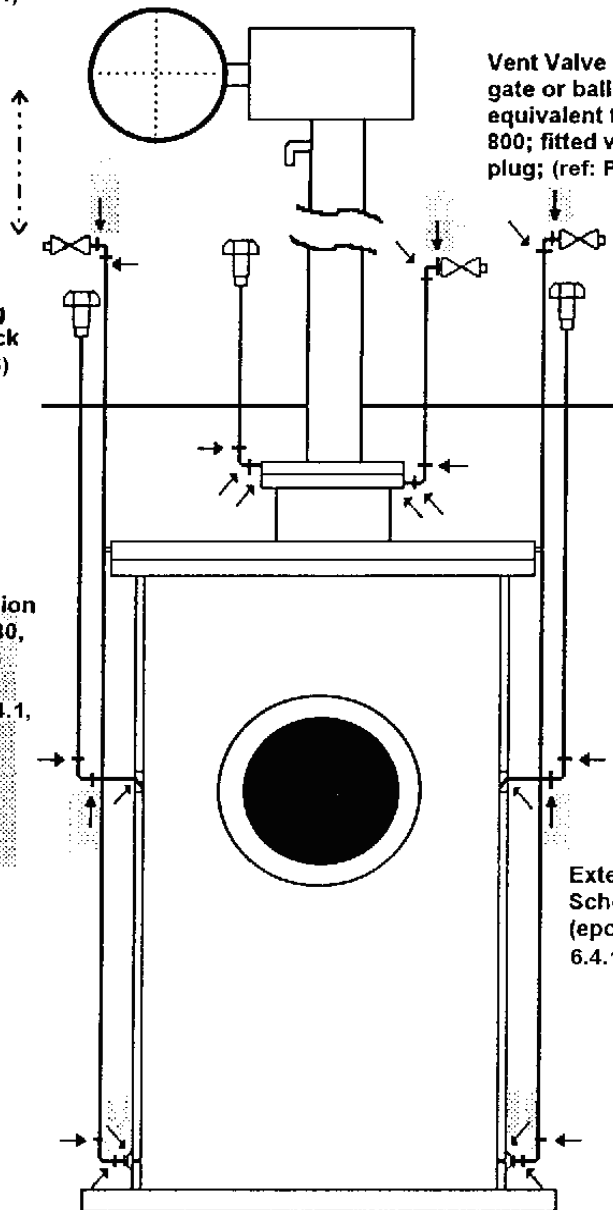
The Drain and Vent Connections shall be piped up to approx. 250mm (10 in.) below the operating level;
(ref: Para. 6.4.1)

Vent Valve and Drain Valve; gate or ball; minimum rating equivalent to API 602, Class 800; fitted w/NPT threaded plug; (ref: Para. 6.3.4)

Seat sealant injection fitting w/integral check
(ref: Para. 6.3.6)

Seat sealant injection piping; Schedule 80, AISI Type 316L SS (epoxy coated);
(ref: Para. 6.3.1, 6.4.1, and 10.4)

Extended drain piping; Schedule 80, AISI Type 316L SS (epoxy coated);
(ref: Para. 6.3.1, 6.4.1, and 10.4)

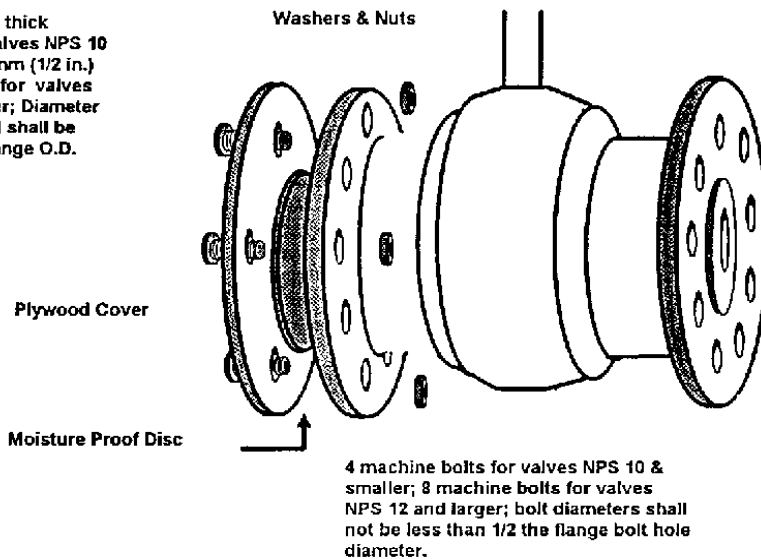


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Indicates seal weld locations

Sketch B – Valve End Protection Requirements (NPS 3 and above)

**Fig. 1
FLANGED VALVES**

10 mm (3/8 in.) thick plywood for valves NPS 10 & smaller; 12 mm (1/2 in.) thick plywood for valves NPS 12 & larger; Diameter of the plywood shall be equal to the flange O.D.

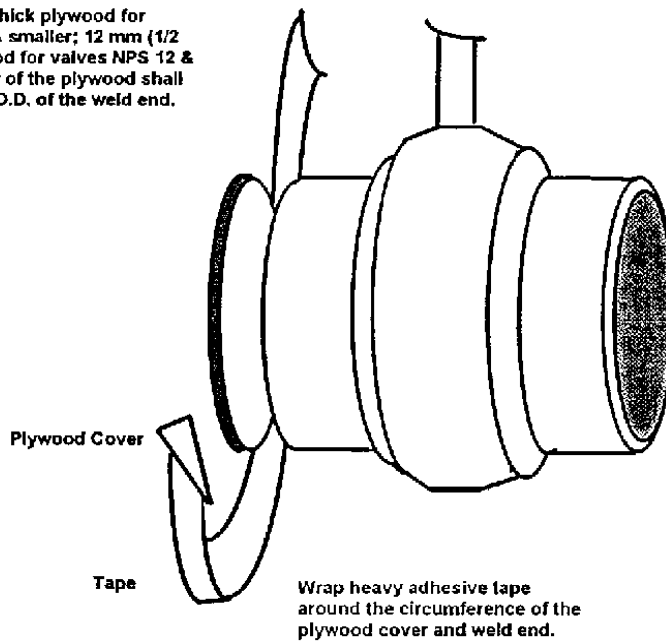


Coat raised face or RTJ groove with heavy grease;

Cover with heavy duty moisture proof disc; Disc diameter shall be equal to the I.D. of the bolt hole circle.

**Fig. 2
WELD END VALVES**

10 mm (3/8 in.) thick plywood for valves NPS 10 & smaller; 12 mm (1/2 in.) thick plywood for valves NPS 12 & larger; Diameter of the plywood shall be equal to the O.D. of the weld end.



For valves shipped in the open position; tie-rods shall be used through the valve bores (not shown).

Coat weld bevel with high viscosity oil or grease.

APPENDIX 1- Business Models

MINIMUM REQUIREMENTS FOR APPROVAL OF MANUFACTURERS

- 1) Engineering department to handle/perform design, material selection, stress analysis, torque calculation and other related design activities. Engineering team must have the capability and required design tools to perform all designing analysis. Moreover, Engineering must have the means for design proof, validation and verification of designs.
- 2) Assembly and testing capabilities including but not limited to equipment, personnel skills, certifications and required quality control equipment/tools and activities.
- 3) All subcontracted activities (Machning, X-ray, Welding, Painting, Packaging) shall be approved, controlled and monitored by the vendor. All subcontractors will be subject for review and assessment by Saudi Aramco technical assessor/representative as deemed necessary. Vendor shall notify responsible SA office for adding new subsupplier or material to the list.
- 4) Applicable API certifications or equivalent as specified in applicable SAMSS.
- 5) Other requirements may be imposed depending on valve committee evaluation based on vendor's history and experience.
- 6) Other bussiness models can be submitted to the valve committee for evaluation and acceptance accordingly.

MINIMUM REQUIREMENTS FOR APPROVAL OF MANUFACTURERS WITH MANUFACTURING LICENSE AGREEMENT

- 1) Detailed agreement with an approved manufacturer to utilize their designs and confirmation of engineering and technical support.
- 2) Engineering personnel capable to providing routine engineering assistance such as material selection, design verification, developing testing procedures and troubleshooting.
- 3) Assembly and testing capabilities including but not limited to equipment, personnel and required quality control activities and equipment/tools.
- 4) All other subcontracted activities (Machning, NDT, Welding, Painting, Packaging, etc.) shall be approved, controlled and monitored by the vendor. All subcontractors will be subject for review and approval of Saudi Aramco technical assessor/representative as deemed necessary.
- 5) API certifications or equivalent as specified in applicable SAMSS.
- 6) Other requirements may be required depending on vendor's history and experience.